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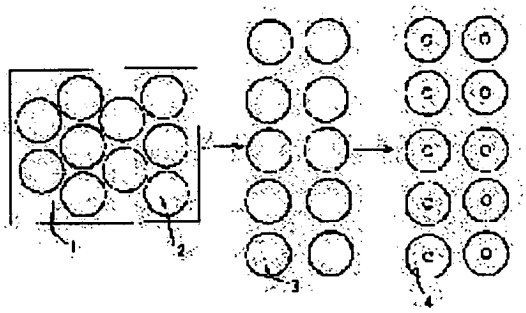
(54) METHOD FOR WORKING OPTICAL DISK

(57)Abstract:
PURPOSE: To enable blanking of disks with high accuracy at a high speed by first blanking outer peripheral parts out of a substrate, then blanking inner peripheral parts.
CONSTITUTION: First, the outer peripheral parts of patterns are blanked. For example, 10 sheets of replicas are blanked simultaneously by one time of stroke. The relative positions of 10 sets of punches and dies are preset and fixed. The disks 3 blanked only at the outer peripheries are blanked by one sheet each to form optical disk products 4. Then, the disks are cut out of the transparent substrate 1 on which the optical disk patterns 2 are reproduced.



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CLAIMS

[Claim(s)]
[Claim 1] The processing approach of the optical disk characterized by for the pattern for optical disks which consists of a circle configuration, or a spiral signal pit and a spiral guide rail piercing the periphery section, and piercing the after inner circumference section first from the transparence resin substrate imprinted two or more sheets in the process which pierces an optical disk.
[Claim 2] It is the processing approach of an optical disk that the periphery section pierces the pattern for optical disks of two or more sheets at once, and the inner circumference section after it pierces the pattern of at least one sheet in claim 1.
[Claim 3] Positioning of the optical disk pattern when piercing the periphery section and the inner circumference section in claim 2 is the processing approach of an optical disk of detecting optically the mark currently formed out of the pattern, and performing it.
[Claim 4] The processing approach of the optical disk which pierces a periphery and inner circumference in claim 1 after preparing a protective coat on the reflective film or record film, and these film at the pattern side of a transparence resin substrate.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the process of the optical disk of molds only for playbacks, such as CD-ROM, and a postscript mold, and a rewriting mold, and relates to the approach of piercing a disk from the resin substrate with which the pattern for optical disks of two or more sheets was imprinted especially.
[0002]
[Description of the Prior Art] There are a mold only for playbacks and a mold which can be written in in an optical disk. There are a laser disk (henceforth, LD) and a compact disk (henceforth, CD) in the former, and it is produced by the current mass. In addition to these, there are CD-ROM, a CD-I, etc. in the mold optical disk only for playbacks as a multimedia medium, and these are going to be greatly developed in the future. Especially the expectation for CD-ROM as an electronic publishing object is great. CD-ROM is used for a current dictionary, a navigation lot Fig., a telephone directory, a patent specification, teaching materials, an encyclopedia, the software for games, etc. Furthermore, it is expected that it develops in the future also in the field as which a sex and extensive number of copies are required instancy like a newspaper or a weekly magazine. If compared with the conventional paper, the weight and the volume of an optical disk per amount of information should become very small, and should become advantageous also in respect of trash on forest resources. Moreover, the possibility of reuse of the plastics which is the ingredient of an optical disk is also high.
[0003] In order to apply CD-ROM to a newspaper etc., it is necessary to produce this at the rate which is equal to a current printing technique. The new production approach which meets this demand is indicated by the Japanese-Patent-Application-No. No. 222692 [three to] specification. The production process by this is explained according to drawing 5 . First, as shown in (a), after forming the photoresist film 17 in the glass substrate 15 with the chromium film 16 by rotation spreading, it records by the Ar laser 19 modulated according to information or a guide rail with cutting equipment. The photo mask (b) which has an information pit and a guide rail through the etching process of development and chromium is produced. This photo mask is stuck to the Si wafer 21 which applied the photoresist 17 as shown in (c), and it exposes. Patterns, such as a pit and a slot, are formed in the photoresist film by developing this. An information pit and a guide rail are formed as a concave pit 5 on Si front face by using this photoresist pattern as a mask and next, performing reactive ion etching. This is used as La Stampa 5. such a description of the production approach of La Stampa -- between short time -- many -- it is in La Stampa of several sheets being producible.
[0004] La Stampa 5 of two or more sheets is fixed to the flat holder 9 with adhesives 23, as shown in (a) of drawing 6 , and (b). The pattern on this La Stampa is imprinted by the front face of the transparence resin substrate 1 by 2P (Photopolymerization) law which uses ultraviolet-rays hardening resin (UV resin). After forcing La Stampa from on the UV resin 24 supplied on the transparence resin substrate, UV light is irradiated with the UV lamp 27 and a shutter 26 from a transparence resin substrate side, and UV resin is stiffened. exfoliating a transparence resin substrate from La Stampa -- one effort -- many -- the replica substrate 28 which has the pattern for optical disks of several sheets can be taken. A replica is continuously producible by repeating this. The reflective film or record film is formed on the resin sheet with which the replica was formed, and the film for protective coats is further prepared on it. Finally, an inside-and-outside periphery is pierced by the shearing work, and it considers as an optical disk. Moreover, after starting on a disk, the reflective film and record film can also be formed. many -- the pattern of only the number of La Stampa can be imprinted at once by one UV irradiation using La Stampa of several sheets, and UV resin. That is, the imprint time amount per optical disk becomes one dozens times the speed of this compared with the conventional injection-molding method. The present print speed is pressed for this.
[0005] in order to consider as an optical disk after replica substrate production -- many -- it is necessary to pierce the

inside-and-outside periphery of a patt[redacted]n large quantities for a short time from t[redacted]sin substrate with which the pattern of several sheets is imprinted [redacted] problem is process tolerance, although th[redacted]learing method by the press machine will be told to a punching hand as shown in drawing 4 . The precision is as follows by the CD-ROM specification. Eccentricity [as opposed to / as opposed to / in an outer diameter / 120**0.3mm / 15+0-0.1mm and a circle configuration signal pit train in a bore] is **70 micrometers. Thus, the precision over inner circumference processing is severe. Therefore, the processing technique of stopping eccentricity within **20 micrometers is needed. The case where the optical disk pattern of ten sheets is formed in one replica substrate here is considered. In order to pierce the disk of ten sheets at once, 10 sets of punch 12 for inside-and-outside processing and a dice 13 are needed. The location of only one sheet is decided among the patterns of ten sheets, and others are easy if it can pierce for the punch and the dice which were fixed beforehand. However, it is very difficult to adopt as bore processing the approach of fixing beforehand and piercing the location of 10 sets of punch, and a dice in this way. That is, the relative location between the optical patterns on a resin substrate of the alignment precision when pasting up La Stampa on a holder and about 100 micrometers of the die length of a resin substrate expanding and contracting by change of ambient temperature, and setting eccentricity to less than **70 micrometers is next to impossible.

[0006] Moreover, as an option, the resin substrate with which the optical disk pattern of two or more sheets was imprinted is fixed, and after doubling the location of the dice corresponding to each pattern, and punch with the detection mark attached to the pattern, it is also possible to pierce two or more sheets to coincidence. However, such a punching machine becomes an expensive considerable thing. Moreover, although it is also possible to fix a dice and punch, to move a resin substrate, to carry out alignment, and to process a piece [every] bore, now, it takes time amount too much. An approach to pierce the former has the above faults.

[0007]

[Problem(s) to be Solved by the Invention] The purpose of this invention is to offer the approach of piercing an optical disk in large quantities and cheaply for a short time.

[0008]

[Means for Solving the Problem] The description of this invention pierces the periphery section of the pattern of two or more sheets at once first, when cutting down an optical disk from the transparence resin substrate with which the optical disk pattern of two or more sheets was imprinted, and after it is in punching Lycium chinense about the inner circumference section with the processing machine which has one point-to-point control system of a pattern at a time.

[0009] This invention is described in detail below. In this punching process, as shown in drawing 1 , the periphery section of a pattern is pierced first. For example, if it is the processing machine which has 10 sets of punch, and a dice, punching Lycium chinense can do the replica of ten sheets at once in one stroke. The relative location of 10 sets of punch and a dice is set up beforehand, and is being fixed. Of course, it is fixed according to the location of the optical disk pattern of ten sheets imprinted by the resin substrate.

[0010] In this case, the relative location between the optical disk patterns on a resin substrate must fit in less than **300 micrometers which is the permissible precision of an outer diameter in every resin substrate. for this reason -- being alike -- as shown in (a) of drawing 6 , and (b), when pasting up Si La Stampa on a holder, it is necessary to make it the pattern location of each La Stampa become always fixed

[0011] Then, as shown in drawing 2 , the mark 10 for location detection is formed in the periphery of the hollow section of the holder formed in the periphery section of La Stampa for adhesion of La Stampa like drawing 3 in the mark 7 for location detection again.

[0012] The mark of La Stampa and a holder is doubled and it is made to paste up using an optical microscope etc. Thereby, mark doubling is possible in the precision of **50 micrometers. That is, it will be said that the location between the patterns of each La Stampa is fixable in the precision of **50 micrometers. If it is this precision, it is [as opposed to / as **100 micrometers / the permissible process tolerance of an outer diameter] sufficient precision about the fixed position precision of punch and a dice. An instantaneous adhesive, an epoxy adhesive, and pressure sensitive adhesive doudle coated tapes can be used for adhesion.

[0013] Bore processing uses at a time as the punching optical disk product 4 one disk 3 with which only the periphery was pierced like drawing 1 . In bore processing per sheet, the location of punch and a dice is fixed, and alignment of a pattern can be made into the control system to which a substrate side is moved, and becomes cheap as a processing machine. The processing processing speed can be raised by putting such two or more bore blanking processing machines in order, and processing them. In short, it is accurate with cheap equipment, and, moreover, punching Lycium chinense becomes possible about a lot of optical disks for a short time.

[0014]

[Function] After piercing the periphery section first in the process which cuts down a disk from the transparence

substrate with which the optical disk [redacted]rn was reproduced, by the approach of p[redacted]ng the inner circumference section, it is accurate and, moreover, p[redacted]essing processing can be carried out at hi[redacted]speed. By this, CD-ROM and other optical disk substrates can be manufactured at a low price in large quantities in a short time.

[0015]

[Example] 2.3mm in thickness Sequential formation of chromium and the chrome oxide was carried out at the glass substrate. The bilayer of chromium and chrome oxide will only be henceforth called the chromium film. This thickness is 100nm and a reflection factor is about 15%. It is 0.14 micrometers about positive type photoresist AZ-1350J on the chromium film. After carrying out rotation spreading, baking was made thickness at 80 degrees C for 1 hour. It applied to cutting equipment equipped with Ar ion laser, and recorded by the laser beam pulse modulated according to the information signal etc. It recorded in the diameter of 80mm spirally by track pitch 1.6micrometer.

[0016] Moreover, as shown in drawing 2 for disk blanking, the mark 7 of four was also recorded on the periphery section. Width of face of a mark was set to 40 micrometers, and die length was set to 3mm. It is made for the intersection 8 which goes to a core and which the mark of four extended to have taken the lead in an optical disk pattern. By developing this, an information pit is formed in the photoresist film as a concave pit. After performing 120 degrees C and 30-minute postbake for this, this photoresist pattern was used as the mask and the chromium film was etched. The wet method which uses the second cerium ammonium water solution of a nitric acid was adopted as this. The width of face of the pit obtained by this was 0.5-0.6 micrometers which fulfills a specification. Moreover, in reactive ion etching, the pit of still narrower width of face was able to be obtained. This is used as a photo mask.

[0017] On the other hand, it is 0.2 micrometers about a photoresist 17 to circle configuration silicon wafer 21 (0.6mm in thickness) 3.5 inches front face. It applied to thickness and baked at 80 degrees C for 20 minutes. As shown in drawing 5 (c), the photo mask and the silicon wafer 21 were stuck, and negatives were exposed and developed with the UV light 29 of a high pressure mercury vapor lamp. It is CF4 by reactivity ion ETCHIINGU equipment (RIE) after carrying out postbake of this. It etched as reactant gas. an RIE system -- an parallel monotonous mold -- it is -- the frequency -- 13.56MHz it is . Consequently, the concave pit 22 is formed in a silicon wafer front face as a mark for information. The depth of a pit is 0.11 micrometers. It controlled to become. The photoresist which remains was removed by oxygen ashing and obtained silicon La Stampa 5.

[0018] Thus, ten obtaining silicon La Stampa was fixed to the flat holder 9 made from aluminum using the high-speed hardening mold epoxy system adhesives 23, as shown in (a) of drawing 6 , and (b). The hollow for pasting up La Stampa is made by the holder, and as shown in drawing 3 , the mark 10 of four is formed around each hollow. It was made for the location of the intersection of the production of the mark of four to become fixed between each hollow. Even if this changes a holder, the physical relationship between optical disk patterns is for making it not always change.

[0019] As a transparence resin substrate 1, it is 1.2mm in width of face of 300mm, die length of 370mm, and thickness. The polycarbonate plate was used. The rate of a birefringence is 60nm or less in a double pass. Liquefied acrylic UV resin 24 was dropped by ten pieces at once on this resin plate. The configuration of dropped UV resin adjusted viscosity etc. so that it might become convex. In case this forces La Stampa from a top, it is a device to carry out point contact to UV resin, and for air foam not enter.

[0020] After UV resin extended all over La Stampa, UV light was irradiated for 0.5 - 1 second using the UV lamp 27 and the shutter 26. The outputs of UV lamp are 80 W/cm. The thickness of hardened UV resin layer was about 20 micrometers. The replica substrate 28 is obtained by next exfoliating hardened UV resin layer from La Stampa. As reflective film, the inline-type sputtering system was used and aluminum film was continuously formed in the replica substrate with which the optical disk pattern was imprinted. The thickness is about 70nm. On aluminum film, the plastic film with a thickness of 100 micrometers with which the binder sticks to one side as a protective coat was prepared all over the replica substrate.

[0021] Next, the location of 10 sets of punch and a dice pierced on the disk 3 with an outer diameter of 80mm with the press-working-of-sheet-metal machine currently fixed beforehand. Under the present circumstances, the mark 7 for positioning of La Stampa of a piece is detected optically at least, and the location of a replica substrate can be automatically determined now. The process tolerance was a value with which a specification is filled enough. In this case, the disk 3 of ten sheets is pierced at once.

[0022] The hole with a bore of 15mm was pierced with the press-working-of-sheet-metal machine which has punch and the dice of a lot for the disk by which periphery processing was carried out next. It pierces, after detecting optically the mark for positioning in the periphery section of each disk 3 and fixing the location of a disk. This press-working-of-sheet-metal machine for bores is small, and since it is cheap, it is easy to arrange two or more sets and to gather processing processing speed. The eccentricity of the obtained disk bore was **30 micrometers and the process tolerance which should be satisfied. Moreover, the C/N ratio as an electrical signal property of an information pit was 55-60dB

equivalent to the conventional CD.
[0023]
[Effect of the Invention] According to this invention, after processing two or more periphery sections at once first in the process which pierces a disk from the transparence resin substrate with which the optical disk pattern of two or more sheets was imprinted, by the approach of processing the one inner circumference section at a time, it is highly precise and high-speed and a disk can be pierced. Consequently, CD-ROM which is a read-only mold can be produced now in large quantities in a short time, and optical disk-ization of a newspaper, a weekly magazine, a magazine, etc. is attained. Moreover, it is also possible for it to be quick and to manufacture a postscript mold and the substrate for rewriting mold optical disks at a low price.

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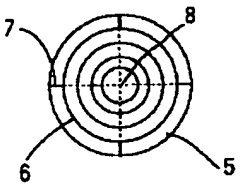
DRAWINGS

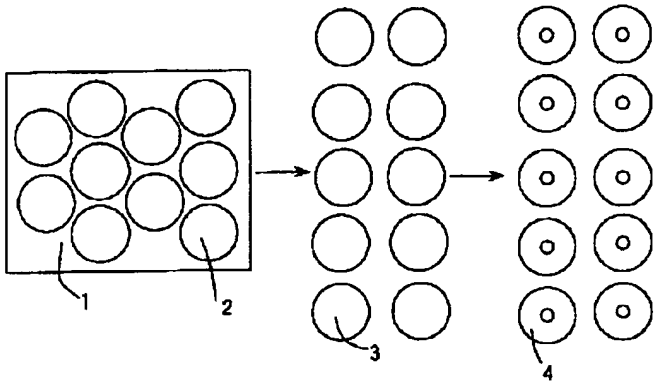
[Drawing 2]

図 2



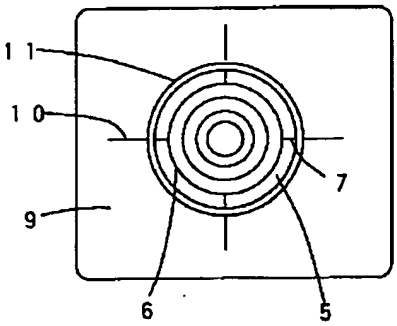
[Drawing 1]

図 1



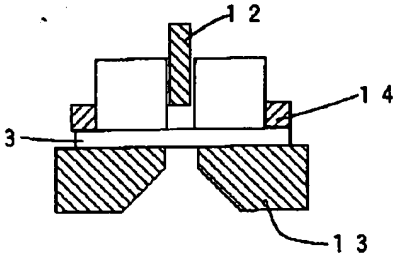
[Drawing 3]

図 3



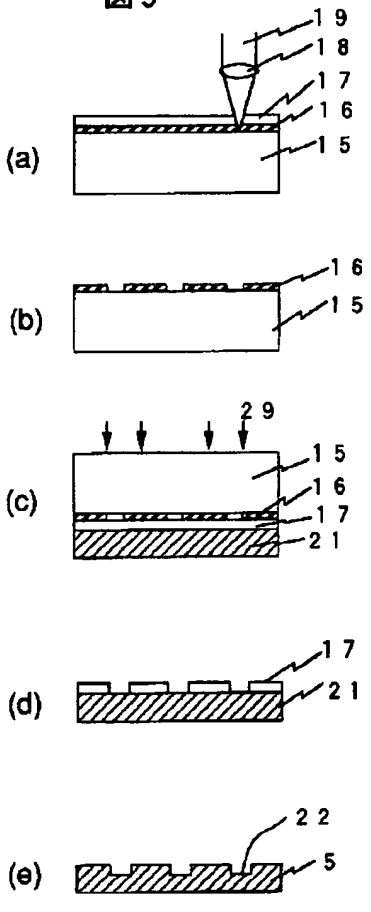
[Drawing 4]

図 4



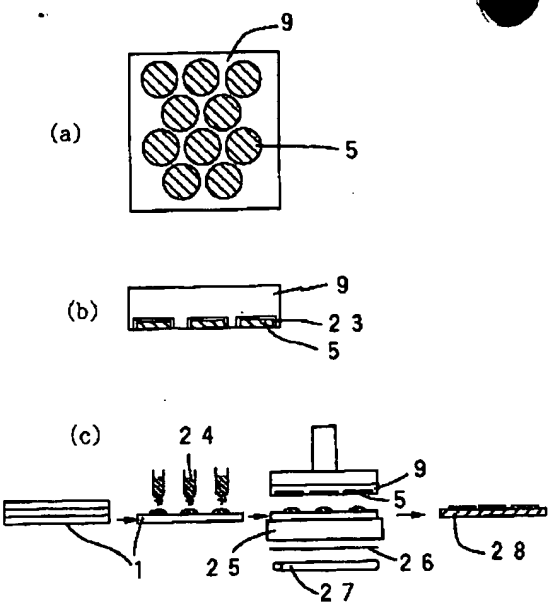
[Drawing 5]

図 5



[Drawing 6]

図 6



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